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ABSTRACT

Free recall of concrete and abstract words, following imaginal, associative, or anagram incidental learning tasks, was tested. Recall was significantly greater for concrete than abstract words, and recall for the imaginal task exceeded that of the associative task, which exceeded that of the anagram task. The interaction between kind of word and incidental task was not significant. (Author)

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Imagery and Association in Incidental Learning:

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The experiment was run under the guise of investigating the relationship between verbal and mathematical skills. The subjects were called upon to draw pictures of, give as many associations as they could to, or as a control to make anagrams of high and low imagery words. These tasks were followed by a mathematical reasoning test, and then by a surprise free recall test of the words.

METHOD

53 introductory psychology students at The University of Toledo served as subjects for extra credit. They were randomly assigned to three treatment groups and were tested in these groups ranging from eight to ten subjects in size. There were 19 subjects in the imagery condition, 18 in the association condition, and 16 in the anagram control condition. The results of three subjects from the imagery condition and two from the association condition were randomly eliminated to create three equal size groups of 16 subjects each. The mean recall of the subjects eliminated did not differ by more than 0.1 words from the group means of their respective conditions and their elimination did not affect the results.

The stimulus materials were the same for all subjects, 24 words projected singly on a screen, by a Kodak Carousel slide projector, for 30 seconds each, with a 0.5 second interval between slides. Timing was controlled by a Hunter Interval Cycler, Model 124 S. Twelve of the words were high imagery words ($I > 6$, Mean I=6.53) and 12 were low imagery words ($I < 3$, Mean I=2.72) selected from the Paivio, Yuille, and Madigan (1968) norms. They were equated for meaningfulness and Thorndike-Lorge frequency.

For the high imagery words, Mean m = 5.53, range 5.12 to 5.96, and for low imagery words, Mean m = 5.53, range 5.20 to 5.88. Scoring A words as 50 and AA as 100 per million, the mean frequency = 15.38 per million for high imagery and 17.50 per million for low imagery words. The order of presentation of high and low imagery words was block randomized, and for half the subjects in each treatment, the positions of high and low imagery words were reversed.

All subjects were instructed that this was an experiment to discover possible relationships between certain verbal abilities and mathematical reasoning. For the first part of the task several words would be projected singly onto a screen for 30 seconds each.

Subjects in the imagery incidental learning condition were instructed to "draw a picture to represent the word on the screen. Some words will be easy to draw a picture of. If the word is one that isn't usually presented in picture form, just think of any picture the word brings to mind and draw that picture. We aren't concerned with artistic ability, but please make sure that your drawing will be recognizable." They were further instructed that if they finished the picture before the 30 seconds were up, to use the remainder of the time to improve the picture.

Subjects in the association incidental learning condition were instructed to "write down as many words as you can associate with the word presented on the screen" in the alloted time.

Subjects in the anagram control condition were instructed to "write down words made up of the letters in the word on the screen". They could "use other letters of the alphabet, but use as many letters in

the original word on the screen as you can for each of the words you compose".

In all conditions, the subjects were to perform the tasks in a booklet of blank pages, using a separate page for each slide. After the 24 slides had been presented, the booklets were collected. All subjects were then given a mathematical reasoning test, consisting of 30 sequences, three to seven numbers in length. Each sequence contained a logical pattern of development, and they were to fill in the next number in the sequence. After being allowed four minutes to work on this, they were told to turn over their sheets and write the words which had appeared on the screen on the back of their sheets. They were allowed three minutes for this surprise recall test.

RESULTS

The mean number of high and low imagery words correctly recalled for the three incidental learning conditions are present in Table 1.

TABLE 1

Mean Number of Words Correctly Recalled

	Condition		
	Drawing	Association	Anagram
High Imagery Words	6.50	5.86	2.06
Low Imagery Words	5.94	4.38	1.56
All Words	12.43	10.25	3.63

As can be seen, high imagery words were better recalled than low imagery words in all conditions, and that recall for the drawing condition exceeded recall for the association condition which in turn was greater than recall for the control anagram condition. Contrary to the prediction, there were slightly smaller, rather than larger differences, in recall between high and low imagery words, for the drawing than for the association condition.

A three by two analysis of variance with repeated measures on the last variable indicated that both the task and word main effects, were significant at the .01 level; $F(2,45) = 58.6049$ and $F(1,45) = 10.9488$, respectively. The interaction between them was not significant; $F(2,45) = 1.4757$, $p > .10$. Newman-Keuls tests indicated that recall for the drawing condition was significantly greater that recall for the

association condition at the .05 level and that recall for each of these conditions significantly exceeded recall for the control condition at the .01 level.

The mean number of intrusion errors were 0.81, 0.36, and 1.00 for the drawing, association and control conditions respectively. A one way analysis of variance indicated that the differences among conditions were not significant, $F(2,45) < 1$.

DISCUSSION

The most interesting finding here is that even though recall differed for the different instructional sets and recall for high imagery words exceeded recall for low imagery words, there was no significant interaction between instructional set and the imagery evoking potential of the stimulus words. If anything, imagery instructions tended to lessen, rather than increase the difference in recall between high and low imagery words. This can not be attributed a la Paivio and Foth (1970), to the subjects disobeying the experimental instructions and instead using stratagies most efficacious for learning the stimulus words, both because of the incidental nature of the learning and because the subjects were required to actually draw the pictures they imaged.

It might appear reasonable to assume that imagery instructions should facilitate recall of low imagery words less than high imagery words, since low imagery words, by definition, are harder to image. However, low imagery words can, if imagery is required, be represented symbolically in terms of high imagery associates. This stratagy was encouraged in the

present experiment by instructing subjects that if they were having difficulty representing the word in picture form, they should draw any picture the word brings to mind. Examination of the drawings indicated that low imagery words were often represented in this fashion. For example, "democracy" was often represented by an American flag, the White House or the Parthenon; "chance" by a game board or a pair of dice, etc.

This stratagy appears a likely one to be used, even in intentional learning, since it appears to be an easy way for subjects to comply with the conflicting tasks of using imaginal mediators with low imagery words and of learning these words effectively. Hence, the elusiveness of the instructional set x word imagery interaction.

If this explanation is accepted, the present results are easily explained in terms of Paivio's dual coding hypothesis. Further, the advantage in recall in the drawing over the association incidental learning conditions supports Paivio and Csapo's (1973) finding of greater efficacy of imaginal over verbal codes for free recall.

The present results also create some problems in interpretation for Morris and Steven's (1974) contention that the sole mechanism through which imagery improves free recall is the ability of imagery to unitize several words into a single image. The nature of the presently used imagery task rendered it unlikely that subjects engaged in much use of imagery as a unitizing device.

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Footnotes

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